To MIKE WADE
FROM BILL DuBOIS
SUBJECT Bulletin 160 draft (suggested changes)

Here ~~[illegible]~~ is one page of changes on chapters 2 and 3
I am also sending copies of 24 pages from the book,
which contain my comments I have not had time
to write in the same form as chapters 2 and 3.

I also think RDI "deficit irrigation" is greatly oversold
as a new practice, and somewhat understated as an
old practice. It is not generally used to reduce water
use, but for other values. And the following crop
quite likely has to replace the water used by the earlier
crop. I'm afraid to promise Goldhamer can save a
million acre feet or more is a disservice until more
evidence is created.

2-5 Under "Fed. Govt" - Mention Sec Int is watermaster on Colo R.

2-7 "Understanding" - Add USDI and Colo R.

2-11 "The law of the River" - Add International Treaty of 1944

2-15 "Less water from Colo R" - (2nd sentence) Change to "MWD has been able to divert". Also mention that the Colo R. has 16.5 MAF/YR of water rights, but not that much water.

2-16 "Reliability" - 9th line after agriculture, add and other uses.
"Degradation" - Seems to ignore the changes in weather

2-17 top line: "increased exponentially" misuses the word "exponentially"

2-18 third line - decimate means to "take one-tenth of"."Impact" would fit better. "Constraints" - (ninth line) change "can be" to "are". Third line from bottom. after "moved out of a community", add "and into another".

2-21 New Surface Storage - Remove "existing" from 1st and 2nd line. On line 5, remove "most of". Line 8 - "Due to the high costs" add disputed effects and mitigation problems.

2-21 *sidebar* I suggest deleting SB# and Author fom each of the 25 changes in the statutes and list them only as chapter and statutes.

3-5 Line 5, change "is" to "are".

3-11 "Note on Value" - third line: I wonder if you can prove that sprinkler irrigation leads to less evaporation. Line 14, the word "food" appears misplaced or misused. "Paid by farmers" and "prices received by farmers" point is not clear.

3-33 "Crop unit water use" is incorrectly stated. Delete "Changes in the" and "due to changes in crop type". Substitute "is" for "can be" in next sentence. Last full line, change "quantifiable" to "quantified".

3-34 Second bullet - "in the valley" - What valley or valleys are you referring to? Specify

3-35 First bullet - DWR should be concerned about yield per acre-foot, not about yield per acre. "Efficiency" bullet seems to omit WUE. Why separate Ag bullet (p. 3-34) from Efficiency (p.3-35,36)?

3-40 Again, no bullet for Ag under Efficiency

ALL ACRES ARE THE SAME SIZE BUT NOT SHAPE

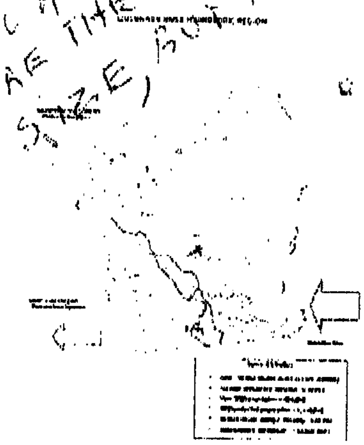


Figure 1 Map of the Colorado River Hydrologic Region can be found on Page 92. When the digital version is completed, the reader will be able to click on this map for a full-page view.

Droves - cattle, animals, people

mation). Local surface water, groundwater, and the SWP provide the remainder of water to the region. Many of the alluvial valleys in the region are underlain by groundwater aquifers that are the sole source of water for local communities.

The river provides irrigation water supplies to more than 600,000 acres of crops each year in the Coachella, Imperial, Palo Verde, Bard, and Mohave Valleys, thereby ensuring more than $1.5 billion annually in agricultural production. Agricultural land uses include livestock ranches, droves of date palm and citrus fruit orchards, large acres of alfalfa, cotton, ~~fresh-market~~ vegetables, melons, and specialty crops like mangoes, raddichio, and arugula. In these fertile ~~areas,~~ at least one crop is harvested every month of the year. Significant areas are double cropped each year. The river is also a significant water supply resource for Metropolitan Water District of Southern California service area in the South Coast Region.

The largest water body in the region is the Salton Sea, a saline lake with a total dissolved solids of about 45,000 mg/L, 25 percent greater than that of ocean water. Most of the environmental water demands in the region are for the Sonny Bono Salton Sea National Wildlife Refuge, DFG Imperial Wildlife Area, and wetland areas on the north shore of the Salton Sea. The Salton Sea ecosystem is considered a critical link on the international Pacific Flyway, by providing wintering habitat for migratory birds, including some species whose diets are based exclusively on the fish in the Sea. ?

? MIGRATORY

The water balance table summarizes the detailed regional water accounting from Volume 2. As shown in the table, imports make up a substantial portion of the water supply in the region.

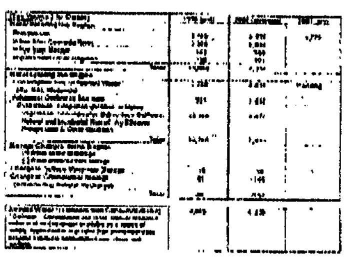


Table 1 Water Balance Summary can be found on Page 93. When the digital version is completed, the reader will be able to click on this thumbnail for a full-page view.

State of the region

"IN THIS REGION"

EXCESS IS USED ON THE COAST

The major water management issue in this region is California's use of Colorado River water in excess of its basic annual apportionment of 4.4 million acre-feet (see Chapter 2 for more information). In addition, groundwater overdraft is occurring in the upper (urbanized) part of the Coachella Valley.

Threatened or endangered fish species on the mainstem of the Colorado River include the Colorado pikeminnow, razorback sucker, humpback chub,

AS IT CROSSES THE BORDER FROM MEXICO

and bonytail chub. Restoration actions to protect these fish may affect reservoir operation and streamflow in the mainstem and tributaries. Other species of concern in the basin include the bald eagle, Yuma clapper rail, blackrail, southwestern willow flycatcher, yellow wabler, vermilion flycatcher, yellow-billed cuckoo, and Kanab ambersnail.

The Salton Sea, with its increasing salinity, selenium, and eutrophication, is the primary focus of international water quality issues in the Colorado River region. The largest sources of the Sea's inflow are the New River (the most polluted river in the USA), Alamo River, and the Imperial Valley Agriculture Drains. The New River conveys urban runoff, untreated and partially treated municipal and industrial wastes, ~~and~~ agricultural runoff from the Mexicali and Imperial Valleys. These pollution sources contribute pesticides, pathogens, silt, nutrients, trash, and VOCs (primarily from Mexican industry) to the Sea. The Alamo River consists mainly of agricultural return flows from the Imperial Valley. Much ~~like the Imperial Valley Agricultural Drains~~, the Salton Sea receives pesticides, nutrients, selenium, and silt from the Alamo River. Pathogens are also problematic in the Palo Verde Outfall Drain and the Coachella Valley Stormwater Channel, both of which drain to the Sea. At some times of the year, nutrient loading to the Sea supports large algal blooms that contribute to odors and low dissolved oxygen levels. Selenium is a more recent constituent of interest, potentially affecting fish and wildlife. Of note, water conservation measures to facilitate water transfers to the South Coast could dramatically increase the levels of selenium, which is primarily from subsurface drainage discharges to the Sea.

The relatively saline Colorado River provides irrigation and domestic water to much of Southern California. Of recent concern are the presence of low levels of perchlorate in the Colorado River itself, and hexavalent chromium at very high levels in wells at Needles near the River. Septic systems at recreational areas along the Colorado are also a concern. Other important water quality issues in this region include increasing levels of salinity, nitrates and other substances associated with animal feeding and dairy operations and septic tank systems, especially in the Desert Hot Springs area and in the Cathedral City Cove area. In the Coachella Valley, nitrates have restricted several domestic water supply wells.

Three tribes—the Fort Mojave Indian Tribe, the Quechan Indian Tribe, and the Colorado River Indian Tribe—are pursuing more water rights related to

Information sources

(Cont. from Page 87)

- U. S. Geological Survey online publications
- Coachella Valley Water District
- Imperial Irrigation District
- Palo Verde Irrigation District
- U. S. Bureau of Reclamation
- Salton Sea Authority
- U. S. Fish and Wildlife Service
- Chemical & Engineering News, "Rocket-Fueled Rivers" August 18, 2003.
- Groundwater Resources Association of California. "Perchlorate and NDMA: Rocket Fuel Contaminants a Serious Challenge to Drinking Water Suppliers" News release April 4, 2002.
- State Water Resources Control Board "Perchlorate Contamination of California's Groundwater Supplies"
- Presentation by staff of staff of the State Water Resources Control Board and staff of the Department of Toxic Substances Control", 2003
- U. S. Environmental Protection Agency Ground Water & Drinking Water website. "Perchlorate". January 23, 2003.
- U. S. Environmental Protection Agency "Perchlorate Environmental Contamination. Toxicological Review and Risk Characterization (External Review Draft)". 2002
- Agency for Toxic Substances and Disease Registry "Toxicological Profile for Chromium". May 25, 2001

FROM MEXICO

AND NEW R.

decrease the water carrying the selenium, as the surface runoff increases but the tile drains flow remains the same

from Las Vegas Wash

FVID outfall.. Mexico, IID, CVWD & SS

the boundary lands claims. As with all claims to water from the mainstem of the Colorado River and any determination by the special master, only the U.S. Supreme Court itself can make the final ruling.

Looking to the future

Ongoing planning effort

Salton Sea Authority studies

Many local water agencies and governments are implementing water conservation programs. Water districts, such as the Coachella Valley Water District, Desert Water Agency, and Mission Springs Water District, and the Coachella Valley Resource Conservation District provide technical assistance to the managers of the region's large landscaped areas, such as golf courses, to evaluate and offer suggestions for improvement for the irrigation hardware and operations at their facilities. The Coachella Valley Water District (CVWD) provides loans to its retail customers for irrigation system upgrades. Desert Water Agency (DWA) offers classes, in English and Spanish, to homeowners, property management personnel, and government and school personnel on irrigation efficiency strategies and tools.

CVWD, working with DWA, has an active groundwater recharge program for the upper end of the Coachella Valley (generally, the urbanized part of the valley). CVWD recharges groundwater with imported Colorado River supplies and with Whitewater River flows using percolation ponds. CVWD and DWA levy extraction fees on larger groundwater users in the upper Coachella Valley.

MISLEADING

Over the years, the United States Bureau of Reclamation and others have considered potential solutions to stabilize the Salton Sea's ~~salinity and~~ elevation. Most recently, the Salton Sea Authority has been performing appraisal level evaluations of some of the frequently suggested alternatives, such as large scale pump-in, pump-out pipelines to the Ocean. The authority is currently investigating integrated strategies where a smaller, lower salinity lake with a stable water surface would be coupled with treatment/desalination of some brackish inflows. The treated water could then be sold or could be part of a water transfer that would help fund the project. Because water transfers generally reduce flows to the Sea and increase the cost and complexity of restoration, these solutions that account for water transfers are currently the most favored. By whom ?

PUNK
THE WATER LEAVES,
THE SALT STAYS.

The concept considered by the authority would also include creating shallow water habitat and implementing other measures in areas where otherwise exposed sediments could create potential dust control concerns. One arrangement would involve constructing a dike-like structure in an east-west alignment near the narrowest middle area of the Sea. This structure would impound water on one side and allow the other side to provide an outlet for saline water and also to serve as the shallow water habitat area. Under this arrangement, the structure would need to be about 8.5 miles long.

In 1993, the United States Fish and Wildlife Service (UFSWS) published a draft recovery implementation plan for endangered fish in the upper Colorado River Basin. The draft plan included protecting instream flows, restoring habitat, reducing impacts of introduced fish and sportsfish management, conserving genetic integrity, monitoring habitat and populations, and increasing public awareness of the role and importance of native fish.

OMIT upper colorado

In 1995, the United States Department of the Interior (DOI) executed partnership agreements with California, Nevada, and Arizona to develop a multispecies conservation program for ESA-listed species and many non-listed, but sensitive, species within the 100-year floodplain of the lower Colorado River, from Glen Canyon Dam downstream to the Mexican border. In 1996, a joint participation agreement was executed to provide funding for the program. USFWS has designated the Lower Colorado River Multi-Species Conservation Program (LCRMSCP) steering committee as an ecosystem conservation and recovery implementation team pursuant to ESA. The conservation program will work toward recovery of listed and sensitive species while providing for current and future use of Colorado River water and power resources and includes USBR's Colorado River operations and maintenance actions for the lower river.

has agreed to

Under the Colorado River Quantification Settlement Agreement, ~~it is expected that~~ Imperial Irrigation District transfer up to 200,000 acre-feet per year of water to San Diego County Water Agency and 103,000 acre feet per year to Coachella Valley Water District through water use efficiency or other land management changes. Lining of the All-American and Coachella canals would produce 78,000 acre feet per year for use by ~~Metropolitan Water District~~ or SDCWA ~~[Local agencies have until Oct. 12, 2003, to adopt the QSA]~~ (See Chapter 2 for more information.) Recent legislation also committed the state to Salton Sea Restoration.

part of the c... ... I don't see ...

Agricultural water use efficiency

Agricultural water use efficiency efforts involve improvements in technology or management of agricultural water use that result in benefits to water supply, water quality, or the environment. In 2000, California irrigated an estimated 9.6 million acres of cropland with about 33.7 million acre-feet of water (checking). In 2000, the California Bay Delta Authority (CBDA, formerly CALFED) estimated the net water savings associated with proven improved agricultural water use efficiency measures to be 206,000 to 565,000 acre-feet per year in the Central Valley ~~alone~~. Also, CBDA estimated flow and timing benefits to be an additional benefit of 200,000 to 600,000 acre-feet per year. ~~A possible additional net water savings from regulated deficit irrigation (see sidebar) is estimated to be 1 million to 1.5 million acre-feet per year.~~

Kern County Water Agency

OLD STORY NOT SIGNIFICANT TODAY

Kern County Water Agency reports significant improvements in irrigation efficiency. An analysis of data in 1986 compared to 1975 showed an 8 percent improvement (from 67 percent in 1975 to 75 percent in 1986). This improvement has reduced the total applied water use in the San Joaquin Valley portion of Kern County by about 250,000 acre-feet, enough water to irrigate about 70,000 acres. Since 1986 Kern County has added 61,500 acres of trees and vines. These now make up 37 percent of the total irrigated acreage. Nearly all of this new acreage has low volume drip irrigation systems installed. KCWA estimates the overall on farm water use efficiency now is about 78 percent.

Current agricultural water use efficiency efforts in California

California growers have made great strides in increasing the economic and agricultural efficiency of their water use. Two indicators of this improvement are that the quantity of agricultural production per unit of applied water (tons/acre-foot) for 32 important California crops increased by 38 percent between the 1980-82 period and the 1998-2000 period and that real, inflation-adjusted gross crop revenue per unit of applied water (real dollars/acre-foot) increased by 11 percent between 1980-82 and 1998-2000.

Crop yields

?

Needs rewriting

Colorado River Hydrologic Region

Setting

The Colorado River Hydrologic Region is located in the southeast portion of California. The Colorado River forms most of the region's eastern boundary and the International Boundary with Mexico forms its southern boundary. Nearly all the Colorado River Region has a subtropical desert climate with hot summers and mild winters. Clear and sunny conditions prevail; the region receives from 85 to 90 percent of possible sunshine each year, the highest value in the United States.

Population in the region is concentrated in three areas: in the Coachella Valley, in the Imperial Valley, and in the urban corridor between the cities of Yucca Valley and Twentynine Palms area along Highway 62. Urban water demands in the Colorado River Region represent slightly less than a tenth of the overall applied and net water demands.

About 90 percent of the region's water supply is from surface deliveries from the Colorado River (through the All American and Coachella Canals, local diversions, and the Colorado River Aqueduct by means of an exchange for SWP water). The Colorado River is an interstate (and international) river whose use is apportioned among the seven Colorado River Basin states by a complex body of statutes, decrees, and court decisions known collectively as the Law of the River (see Chapter 2 for more infor-

AND AN 1944 INTERNATIONAL TREATY WITH MEXICO (AND SUBSEQUENT MINUTES)

Sources of information

- *Water Quality Control Plan, Regional Water Quality Control Board*
- *Watershed Management Initiative Chapter, Regional Water Quality Control Board*
- *2002 California 305(b) Report on Water Quality, State Water Resources Control Board*
- *Bulletin 118 (Draft), California's Groundwater, Update 2003, Department of Water Resources*
- *Nonpoint Source Program Strategy and Implementation Plan, 1998-2013, State Water Resources Control Board, California Coastal Commission, January 2000*
- *Strategic Plan, State Water Resources Control Board, Regional Water Quality Control Boards, November 15, 2001*
- *Colorado River Board of California*
- *Western Regional Climate Center website.*
- *Metropolitan Water District of Southern California.*
- *Colorado River Basin Regional Water Quality Control Board*
- *California Department of Health Services (DHS), "Drinking Water Standards".*
- *DHS. "Chemical Contaminants in Drinking Water" July 3, 2003.*
- *DHS "Drinking Water Action Level, Chemicals with Recent Detections", June 12, 2003*
- *DHS "Drinking Water Action Levels, Historic Action Levels and Action Levels for Contaminants Detected Infrequently". June 30, 2003.*
- *DHS. "Specific Contaminants of Current Interest: arsenic, chromium-6, manganese, methyl tertiary butyl ether (MTBE), N-nitrosodimethylamine (NDMA), perchlorate, 1, 2, 3-trichloropropane*
- *DHS "Perchlorate in California Drinking Water: Status of Regulations and Monitoring". July 2, 2003.*
- *DHS "Chromium-6 in Drinking Water: Background Information" April 8, 2003*
- *DHS. "Chromium-6 in Drinking Water. Regulation and Monitoring Update" July 16, 2003.*
- *California Environmental Protection Agency website. List of Drinking Water Contaminants and MCLs*
- *California Environmental Protection Agency website. Drinking Water Contaminant Candidate List.*
- *California Environmental Protection Agency website. Regulations and Guidance.*
- *U. S. Geological Survey National Water Quality Assessment Program*

Continued on Page 89

Improvements in the efficiency of agricultural water use result primarily from efforts in three related areas:

a) improving on-farm irrigation systems and district water delivery systems: hardware upgrades

b) managing on-farm irrigation systems and district water delivery systems more efficiently: water management, and

c) reducing water consumption: reducing evapotranspiration

a. Hardware upgrades

Trends in irrigated Acreage (in million acres)

Irrigation method	1990 Acreage	%	2000 Acreage	%	% change (acreage)	% change (method)
Gravity (furrow, flood)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sprinkler	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	[illegible]	100	[illegible]	100		

Source: DWR

Table 1. Trends in irrigated acreage. This table can be found at the end of this chapter. In a digital version of the Update, this thumbnail will be linked and clickable to the full-size table.

correctly characterized

Most orchards and vineyards in the state are under pressurized irrigation systems with almost all trees and vines established during last five to 10 years receiving drip irrigation. Between 1990 and 2000, acreage with drip irrigation in California grew from 0.8 to 1.9 million acres (see left).

Advanced on-farm technologies in use include GIS, GPS and satellite crop and soil moisture sensing. The satellite-based technologies allow growers to improve the precision of their water application.

"Net losses" but change in what the water does. Less vegetation on the canal bank, less [illegible] infiltration.

The shift to pressurized irrigation systems often requires modernization of the district water delivery systems. Increasingly, irrigation districts are upgrading and automating their systems to enable precise, ~~flexible,~~ and reliable deliveries to their customers. They are reducing system losses by lining canals or converting to pressurized pipe systems, developing spill recovery and tail water return systems; employing regulatory reservoirs, improving the efficiency of pumps; and implementing conjunctive water use programs. Even with existing efforts presently underway, there is still a significant opportunity for on-farm irrigation and district water delivery system improvements. AT A COST TO OTHER WATER USERS

b. Water management

Both on-farm and district systems must be managed efficiently to take advantage of hardware improvements. Districts are using tools including automated gates operated using SCADA systems along with computer-based monitoring equipment, including workstations, map boards, file and database servers, and centralized communications equipment. Personal computers connected to real-time communication networks and a local area network allows a free flow of information from the field to a centralized location. These features enable district staff to monitor flow, exert supervisory control over each field site, and log data on a continuous, electronic basis. With such systems, district staff spends less time monitoring and manually controlling individual sites, allowing them to plan and operate the system in a strategic and integrated manner. This facilitates a systemwide view along with improved reliability of the communications system.

Many growers employ evapotranspiration and soil moisture data for irrigation scheduling and use sophisticated automated and computerized irrigation systems for irrigation, fertilizer, and pest management. They use real time satellite weather information and forecasting systems to schedule irrigation. Users generate more than 70,000 inquiries per year to the California Irrigation Management Information System (CIMIS), the Department of Water Resources' weather station program that provides evapotranspiration data. Universities, districts, and consultants also make this information available indirectly via newspapers, websites, and other media to a much wider audience.

In addition, those who irrigate by gravity employ laser leveling and engineered furrow, basin and border designs to ensure that water application meets crop and soil water requirements. Growers use other methods and technologies to schedule their irrigation as well and some districts provide a mobile laboratory service to conduct in-field evaluation of irrigation systems coupled with irrigation management recommendations. Once considered "innovative technologies," these are now standard practices with growers.

c. Reducing evapotranspiration

Evapotranspiration is the amount of water that evaporates from the soil or transpires from the plant. A grower can reduce evapotranspiration, that is, water demand, by:

- reducing unproductive evaporation (water that evaporates from the soil surface);
- altering plant water requirements through genetics (plant breeding);
- shifting crops (to plants that need less water); or IF THE MARKET PERMITS
- reducing evapotranspiration (regulated deficit irrigation- see sidebar.)

Presently, the most promising avenue to reduce evapotranspiration on a large scale appears to be through the reduction of transpiration. ?

Potential benefits of agricultural water use efficiency

IN SOME CASES

~~Overall~~, on-farm improvements in water use efficiency can benefit farmers by increasing net profit, reducing water applied, reducing groundwater overdraft, increasing yield, improving crop quality, lowering the cost of inputs, and potentially profiting from the sale of the conserved water.

SAVES NO WATER SAVINGS IS THE REDUCTION IN COST OF PRODUCING ELECTRICITY

District water system improvements can benefit districts by increasing their ability to meet their customers' demand and reducing water losses. Shifting electric load from on-peak to off-peak could be another benefit related to agricultural water use efficiency. EXPLAIN

Environmental benefits may include water quality improvements and reduced drainage, surface runoff, and TMDLs (Total Maximum Daily Loads), increased stream flow and improvements in temperature and timing. The multiple benefits associated with agricultural water use efficiency in key agricultural regions have been evaluated by CBDA and described regionally from a watershed perspective as 'targeted benefits' and associated 'quantifiable objectives'. Occasionally, improvements in water use efficiency on the field can cause negative environmental effects, such as reduced runoff to water bodies downstream. + underground

Always

SHOULD NOT BE IN "WUE" section

urban areas

In addition to meeting CBDA goals, California must also reduce the use of Colorado River water from 5.2 million to 4.4 million acre-feet. California for many years has been using more than its annual allocation. In addition, California must also reduce its dependence on long-term groundwater overdraft.

their

In 2000, the California Bay Delta Authority (CBDA, formerly CALFED), estimated the net water savings associated with proven improved agricultural water use efficiency measures to be 206,000 to 565,000 acre-feet per year in the Central Valley alone. Also, CBDA estimated flow and timing benefits to be an additional benefit of 200,000 to 600,000 acre-feet per year. The CBDA estimates include proven improvements in irrigation hardware and scheduling, but not reductions in evapotranspiration.

Copied Redundancy from Page 5-5

Potential costs of agricultural water use efficiency

The CBDA Record of Decision estimated water savings at two levels of expenditures. The first level results when growers and water districts implement efficient water management practices as a part of their standard operation. This level estimates net water savings of 118,000 to 322,000 acre-feet per year at a cost of $35 to $ 95 per acre-foot. The second level results from the investment of funds by the state and Federal agencies with net savings ranging from 88,000 to 243,000 acre-feet per year at a cost of $80 to $900 per acre-foot. CBDA, therefore, identified a total of 206,000 to 565,000 acre-feet of net water savings per year at a cost of $110 to $1000 per acre-feet per year. The cost assumes on-farm efficiency of 85 percent.

← IN C.V., NOT WHOLE STATE

? RIFLICATION

Major issues facing additional agricultural water use efficiency

Funding

More funding is needed for agricultural water use efficiency projects. Funds dedicated to water use efficiency have fallen below commitments made in 2000 through the CBDA Record of Decision that called for an investment of $1.5 billion to $2 billion from 2000-2007. State and federal agencies committed to funding 50 percent, 25 percent each, with local agencies funding the remaining 50 percent of water use efficiency activities. State and federal expenditures are listed at right.

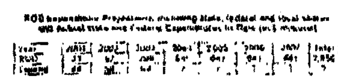


Table 2. ROD expenditure projections. This table can be found at the end of this chapter. In a digital version of the Update, this thumbnail will be linked and clickable to the full-size table.

Through the Agricultural Water Management Council's Memorandum of Understanding (MOU), local agencies have committed to funding locally cost effective Efficient Water Management Practices (EWMPs). State and federal programs, on an irregular basis, may provide a source of funding for the EWMPs beyond the MOU level, for actions other than standard EWMPs, and for those EWMPs that may not be locally cost effective.

In concept.

While initiatives have provided state funding for water use efficiency projects through Propositions 13 and 50, retaining a sufficient state and federal expertise to administer the programs and provide financial and technical assistance in this field is not easy with across the board budget and staff cutbacks. Many irrigation districts also face increasing challenges to implement water use efficiency actions and to maintain a permanent expertise or institutional continuity with limited staff and budgets.

GOOD STATEMENT

Investments in research and demonstration are critical. Substantial financial support for research, development and the demonstration of efficient water management practices in agriculture has come and continues to come from the agricultural industry. Support also comes from the early adopters of new technology who often risk their crops, soils and dollars when cooperating to develop and demonstrate technology innovations.

Grant programs may miss the opportunity to fund worthwhile projects in small and disadvantaged communities. It is often difficult for them to compete for limited grant funds, although their needs are often great. The impact on farm workers is often neglected when considering different approaches to water use efficiency.

In some areas of the state, funding for water conservation comes from the ability to transfer water. Such water sales may play a significant role in financing future water use efficiency efforts.

Implementation

Much has been accomplished, but still more needs to be done to increase agricultural water use efficiency and to optimize agricultural profits per unit of water without compromising water quality or the environment.

MISSTATED

The Agricultural ~~Water Suppliers~~ Efficient Water Management ~~Practices~~ Act of 1990 (AB 3616) and the Central Valley Project Improvement Act (CVPIA) established a framework for agricultural water use efficiency. Developed under AB 3616, 55 California water suppliers have entered into a voluntary and cooperative Memorandum of Understanding Regarding Efficient Water Management Practices (EWMPs) by Agricultural Water Suppliers. The retail districts, comprising more than 3.65 million acres of irrigated agricultural land statewide, are committed to developing water management plans and implementing cost-effective EWMPs. So far, 24 signatories subject to federal CVPIA planning requirements have plans that have been "endorsed" by the Council. Another 10 signatories not subject to CVPIA have submitted plans, eight of which have been endorsed. The California Agricultural Water Management Council oversees the progress of water management planning and the implementation of EWMPs.

A number of water suppliers have not joined the MOU~~, and many who have joined have not submitted plans or fully implemented efficient water management practices~~. Small districts often do not have the technical and financial abilities to develop plans or implement efficient water management practices. Opportunities exist beyond the implementation of EWMPs that could result in major improvements in water use efficiency and new methods and technologies that can be expected to significantly increase conservation potential. IF THE $ COME FROM EXTERNAL SOURCES

NOT TRUE. YOU HAVE BEEN ADVISED OF THIS, (AUG 2003)

The CBDA Record of Decision of 2000 (ROD) further institutionalized agricultural water use efficiency. State and federal agencies are committed through the ROD to provide financial and technical assistance to local agencies for the implementation of water use efficiency measures.

but may not survive CLD

A. HARDWARE UPGRADES

Optimum operation of irrigation and distribution systems can significantly improve water use efficiency. An issue to growers is often the inability to apply the exact amount of irrigation water when they need it. Water system improvements such as integrated supervisory control and data acquisition systems (SCADA), canal automation, regulating reservoirs, and other hardware and operational upgrades, could provide flexibility to deliver the water when and where it is needed in the appropriate quantities. BUT ARE VERY EXPENSIVE

Growers invest significantly in on-farm irrigation system improvements. In terms of future investments, the Cal Poly Irrigation Training and Research Center estimates that 3.8 million acres could be converted to precision irrigation such as drip or micro-spray irrigation. While this may not reduce crop water demand, it could improve the distribution uniformity of water applied, reduce non-beneficial evaporation losses, and thus allow the grower to apply less water to the field. Research has shown water application reduction at two to three percent with yields increasing from 19 to 35 percent, an increase in productivity of 30 percent with the same amount of applied water (verifying with Cal Poly.)

in most cases.

(Exceptional cases) whether cost effective is another question

B. WATER MANAGEMENT

While designing, installing and maintaining efficient irrigation and water distribution systems are essential, the management of water through the district distribution system and irrigation scheduling on farm are also

List them.

extremely important. Some good tools and information are available for district system management and irrigation scheduling, but more efforts to refine those tools and better reach, educate, and motivate districts and growers could increase water savings.

C. REDUCING TRANSPIRATION

More efforts need to be dedicated to researching and promoting ways growers can reduce evapotranspiration.

Measurement, planning and evaluation

The measurement of water and associated information provided to the water user is essential to efficient water management. Without a measurement of water applied, a grower cannot manage water efficiently.

Documenting water savings related to the various programs rests on the ability to track water use. Water use is not measured in some areas of the state.

There is a lack of sufficient statewide comprehensive data on the acreage under various types of irrigation systems, methods of irrigation, amount of applied water, crop water use, cultural requirements, irrigation efficiency, the accurate measurement of water use and net water savings, and the cost of irrigation improvements. These are obstacles for assessing irrigation efficiencies and planning for further improvement. The collection and management and dissemination of such data to growers, districts, and state planners are necessary for promoting water use efficiency.

misleading word

Information on the effect of reducing non-productive evaporation losses and reducing crop evapotranspiration is lacking. Similarly, not enough is known by DWR about the potential savings associated with controlled crop dry-down of alfalfa, where growers forego the late summer cuttings of alfalfa in order to use that water on another field or to voluntarily transfer water, or alternative land use in a voluntary and compensated program during dry years.

Use of pressurized irrigation systems has recently increased and has improved water use efficiency. These systems require energy, facilities, and materials for proper operation. The long-term costs and benefits of these systems merit study.

Education and motivation

Likewise, there is a need for information related to why California growers adopted water use efficiency practices and how those practices could be encouraged and sustained. Furthermore, we are not sure what types of incentives districts respond best to, while we have seen evidence of a strong response to financial incentives whenever offered in a simple, understandable format and process. Which technological changes should be pursued for short-term situations — during water shortages — compared to long-term, and which behavioral changes are most effective short and long term?

who is we? DWR?

Innovation

New agricultural water conservation technologies and techniques will be needed to meet the demand for water over time. For example, the water-saving weather-based controllers (ET controllers) that are becoming increasingly popular in the urban sector may have an important role to play in the agricultural sector as well. By establishing an atmosphere where growers and districts can pursue new methods while keeping production risks to a minimum, these practices can be adopted.

NOT RESERVOIRS?

what does this mean?

Dry-year considerations

Measures can and need to be taken now to prepare for dry years. Agriculture is often called upon during dry years to refrain from farming a portion of land with compensation for the water not used. Traditional approaches to meet water needs during dry years need to be reviewed and other approaches need to be explored, such as an alfalfa summer dry down program.

why don't we

and for 15 years in some cases

Farmers know already

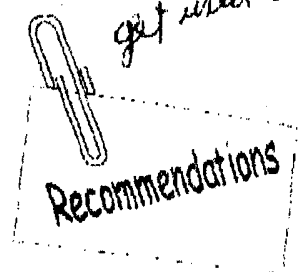
Recommendations

Recommendations to achieve additional agricultural water use efficiency

The following actions reflect some of the possible solutions to the issues raised in the previous section. A wide range of strategies will need to be employed to accomplish the actions including financial incentives; revisions in state and local codes and standards; and legislative initiatives. Most of these activities will be cooperative efforts, involving state, federal, and local agencies, growers, and other stakeholders.

- Expand CIMIS, mobile laboratory services, and other training and education programs to improve irrigation scheduling and efficiency.
- Fund large and long-term RDI demonstration and research plots and other promising programs to reduce evapotranspiration and document potential savings.
- Develop necessary protocols and guidelines for growers and districts to promote implementation.
- Fund research on producing increased yield and higher quality of crops with the same water use through subsurface drip and other on-farm technologies.

makes sense in most cases when return flows do not get used.



Measure, plan and evaluate

- Measure water to customer and bill by volume of use with rate structures that encourage water use efficiency.
- In cooperation with the agricultural community, support scientific research, development, demonstration, monitoring and evaluation components of agricultural water use efficiency technologies and management practices.
- Collect, manage and disseminate statewide data on acreage under various irrigation methods, the amount of water applied, crop water use, and the benefits and costs of water use efficiency measures.
- Work with state and federal grant recipients and others to obtain more useful and consistent data from funded projects and other activities, including the documentation of sources and methods behind data presented.
- Encourage comprehensive planning and implementation of water conservation activities at the agency and regional level.
- Gather information through surveys and other instruments on how growers use water.
- Develop comprehensive methodology for quantifying irrecoverable WATER losses and for analyzing benefits and costs of projects.
- Couple research and technology development with incentive-based implementation programs.
- Evaluate the environmental impacts of water use efficiency. EIRS

Educate and motivate

- Develop community based social marketing surveys and strategies for conservation activities to foster water use efficiency, with the participation of the agricultural and water industries and environmental interests.
- Identify and overcome barriers to improved water use efficiency, communicate the benefits, provide incentives, and gain commitment from all involved.

Innovate

- Explore and identify innovative technologies and techniques to improve water use efficiency and develop new EWMPs to correspond with new information.
- Fast track pilot projects, demonstrations, and model programs exploring state-of-the-art water saving technologies and procedures and publicize results widely.

6. Prepare for dry years and extraordinary shortages

Grasslands Water List

- Have a comprehensive campaign ready to go for next drought.
- Conduct contingency planning for extraordinary short- and long-term shortages.
- Support further research in development of strategies for voluntary alternative land use in drainage impaired lands.
- Support further research in summer crop dry-down and explore incentives for farmers and districts to forego summer cut of alfalfa, and other similar programs.

<u>Sidebar</u>

Regulated deficit irrigation

Regulated Deficit Irrigation (RDI) is an irrigation management strategy that purposely stresses the trees or vines at specific developmental stages with the goal of reducing crop water use, improving crop quality, decreasing disease or pest infestation or reducing production costs without reducing yield or profits. RDI was first developed in Australia and New Zealand in the 1980's. Research began in California in the 1990's with initial results showing the potential for significant water savings (a reduction in evapotranspiration) while increasing or maintaining crop profitability and allowing optimum production.

Research has been conducted on wine grapes, prunes and pistachios for the past ten years. Less research has been done on almonds, citrus, peaches, olives, apples, pears and walnuts. RDI has begun to be widely accepted in wine grapes with wineries and other trade groups promoting the irrigation strategy. To some extent, this is true for pistachios as well. It has not been widely used yet with any other crops in California.

sugar beets

NOT TRUE

The traditional irrigation management strategy has been to avoid crop water stress. RDI is used primarily on tree and vine crops where crop quality and yield is of primary concern. Stress imposed at specific growth stages can improve crop quality, even though it limits or reduces plant growth or development. Wine grapes are a clear example: mild stress imposed through the growing season decreases canopy growth, but produces grapes with higher sugar content, better color and smaller berries with a higher skin to fruit volume ratio.

— and sugar beets

Regulated deficit irrigation in particular could result in several possible benefits. First, through increased productivity and efficiency, the economics of tree and vine production could become more profitable. Some crops disease and insect problems could be lessened, decreasing the application of pesticides.

If RDI is adopted by a significant percentage of growers in the state; RDI could result in substantial statewide water savings. Dr. David Goldhamer of the University of California Cooperative Extension has estimated potential water savings ranging from four to 14 inches per year. He then extrapolated the potential statewide savings by applying the crop savings to the approximate crop acreage. The estimated water savings for RDI range from one million to 1.5 million acre-feet per year, per Table 3 at right.

Table 3 [illegible]

Crop	Bearing Acreage	Estimated Savings [illegible]	[illegible] Savings [illegible]
Almonds	[illegible]	4 - 14	[illegible]
Winegrapes	[illegible]	[illegible]	[illegible]
Citrus	[illegible]	[illegible]	[illegible]
Pistachios	[illegible]	[illegible]	[illegible]
Prunes	[illegible]	[illegible]	[illegible]
Peaches	[illegible]	[illegible]	[illegible]
Olives	[illegible]	[illegible]	[illegible]
Apples and Pears	[illegible]	[illegible]	[illegible]
Walnuts	[illegible]	Unknown	Unknown
Total	[illegible]		[illegible]

Table 3. Range of estimated net water savings relative to practices using regulated deficit irrigation. This table can be found at the end of this chapter.

- Let him prove it before you promote it or publish in Bul 160

The cost of RDI is estimated to be $20 per acre-foot per year. (Dr. Goldhamer's basic assumptions for this estimate: 500 acres of trees x 6 inches of savings per year equals 250 acre-feet per year. One temporary help, wage of $10/hour, $1600 per month for 3 months of the early irrigation season equals $4,800 to take pressure chamber readings, record data, provide to irrigator. $4,800/250 equals $19.2 per acre foot). Assuming that

Table 1

Trends in Irrigated Acreage (in million acres)

Irrigation method	1990		2000		% change	% change
	Acreage	%	Acreage	%	(acreage)	(method)
Gravity (furrow, flood)	6.5	67.5	4.9	51.3	- 16.2	-24%
Sprinkler	2.3	23.8	2.8	28.8	5.0	21%
Drip/micro	0.8	8.7	1.9	19.9	11.2	129%
TOTAL	9.6	100	9.6	100		

source: DWR

Table 2

ROD Expenditure Projections, including state, federal and local shares and Actual state and Federal Expenditures to Date (in $ millions)

Year	2001	2002	2003	2004	2005	2006	2007	Total
ROD	31	62	299	641	641	641	641	2,956
Expend.	44	58	64	?	?	?	?	?

Table 3

Table 3. Range of estimated net water savings relative to practices using regulated deficit irrigation (RDI)

Crop	Bearing Acreage	Estimated Savings (inches)	Water Savings (acre-feet)
Almonds	530,000	8- 14	424,000- 618,000
Winegrapes	480,000	8- 12	320,000- 480,000
Citrus	244,000	6- 8	122,000- 163,000
Pistachios	78,000	10- 12	65,000- 78,000
Prunes	76,000	6- 12	38,000- 76,000
Peaches	70,000	4- 8	23,000- 47,000
Olives	36,000	6- 10	18,000- 30,000
Apples and Pears	49,000	4- 8	16,000- 33,000
Walnuts	196,000	Unknown	Unknown
Total	1,759,000		1,026,000- 1,525,000

This warrants more than speculation before being published in Bul 160

, or without

(in anticipated or existing

or by substitution, to deliver

Water transfers

Water transfers are defined in the Water Code as a temporary or long term change in the point of diversion, place of use, or purpose of use due to a transfer or exchange of water or water rights (see footnote, right). Many transfers, such as those among contractors of the SWP or CVP, do not fit this formal definition. A more general definition is that water transfers are a voluntary change in the way water is usually allocated among water users in response to water scarcity. Transfers can be from one party with extra water in one year to another who is water short that year, and transfers can be between water districts that are neighboring or across the state, provided there is a means to convey and store the water. Water transfers can be a temporary or permanent sale of a water right by the water right holder; a lease of the right to use water from the water right holder; or a sale or lease of a contractual right to water supply. Water transfers can also take the form of long-term contracts contingent on drought conditions. OR PLANNED GROWTH IN DEMAND Generally, water is made available for transfer by five major sources:

water or

- Transferring water from storage that would otherwise have been carried over to the following year. The expectation is that the reservoir will be refilled during the SUBSEQUENT wet seasons.
- Pumping groundwater in lieu of using historically used surface water delivery and transferring the surface water rights. WATER OR
- Transferring previously banked groundwater either by directly pumping and transferring groundwater or by pumping groundwater for local use and transferring surface water rights. WATER OR/AND
- Making water available by reducing the existing consumptive use

Footnote

Temporary water transfers are defined in Section 1728 of the California Water Code as any change of point of diversion, place of use, or purpose of use involving a transfer or exchange of water or water rights for a period of one year or less. Long-term water transfers are defined in Section 1735 of the California Water Code as a transfer of water or water rights involving a change of point of diversion, place of use, or purpose of use for any period in excess of one year.

through crop idling or crop shifting or by water use efficiency measures.

- Making water available by reducing return flows or seepage losses in conveyance systems that would otherwise be irrecoverable for reuse. THIRD PARTIES FREQUENTLY ARE AFFECTED. SEE CRAWFORD DITCH, VISALIA, SALTON SEA

Water transfers are sometimes seen as merely moving water from one beneficial use to another. However, in practice water transfers become a form of flexible system reoperation linked to many other water management strategies including surface water and groundwater storage, conjunctive management, conveyance efficiency, water use efficiency, water quality improvements, and planned crop shifting or crop idling. These linkages to other water management strategies, often result in increased beneficial use and reuse of water overall. One of the most valuable aspects of water transfers can be the flexibility to take advantage of different water management strategies and foster cooperation among water agencies. For example, water transfers can encourage water agencies to more aggressively implement conjunctive management and water use efficiency projects either alone or in cooperation with other agencies to increase local supplies and sell unused water. Transfers also provide a flexible approach to allocating available supplies for environmental purposes.

(OMIT COMMA)

Current water transfers in California *See footnote, left*

Statewide, water transfers have increased since the mid-1980s. Temporary and long-term transfers between water districts rose from 80,000 acre-feet in 1985 to more than 1.25 million acre-feet in 2001 **(see figure 1)**. About 80 percent of this volume is traded on a short-term basis, within the same year. ~~The~~ remaining 20 percent is considered "long-term", for durations ranging from two to 35 years. In addition to these short and long-term transfers, since 1998, there have been several permanent transfers of water rights and contracts with the Central Valley Project and the State Water Project for up to 175,000 acre-feet per year.

110? 45 years

Statewide water conditions have encouraged water transfers as a management strategy. Transfer activity increased substantially during the drought of the late 1980s and early 1990s, especially through the state-run Drought Water Bank and other drought-related state and federal programs. Purchases continued to increase since the mid 1990s, generally a much wetter period. Throughout this period, water transfers have primarily been from agricul-

Footnote

Data in this section are drawn from Chapter 2 and Appendix A of Who Should Be Allowed to Sell Water in California? Third-Party Issues and the Water Market, Public Policy Institute of California, 2003. Ellen Hanak. (available for download at www.ppic.org). These data do not include transfers between farmers within the same water district, which can be substantial in some places.

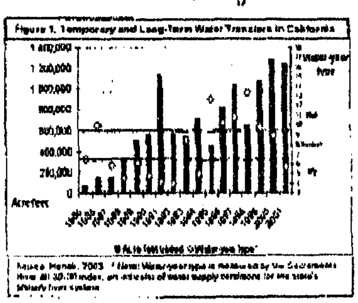


Figure 1 Temporary and long-term water transfers in California. This figure can be found on Page 193. In the final digital version of the Update, this thumbnail will be linked and clickable to the full-size figure.

tural water districts, although in some wet years urban districts in Southern California have also transferred water to other users. The pattern of purchases has changed somewhat between the prolonged drought in the early 1990s and the more recent period (**Figure 2**). Although urban water districts were a primary destination in the early 1990s, accounting for more than 40 percent of all purchases, their purchases have remained flat since the mid 1990s and now account for only 20 percent of all purchases.

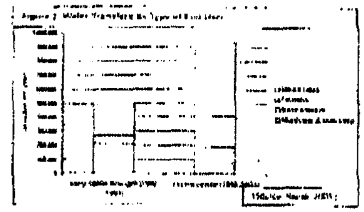


Figure 2 Water transfers by type of end-user. This figure can be found on Page 193. In the final digital version of the Update, this thumbnail will be linked and clickable to the full-size figure.

Two sectors responsible for most growth in transfers have been environmental programs and agriculture. Environmental purchases to benefit wildlife refuges and instream fish populations began during the early 1990s drought. They have increased considerably under the Central Valley Project Improvement Act and CALFED's Environmental Water Account, accounting for roughly 25 percent of the total since1995 and as much as one-third by 2001. Agricultural districts now account for half of all purchases, and have been responsible for two-thirds of growth in transfers since 1995. The bulk of this increase is destined for farmers in the San Joaquin Valley and Tulare Basin, who have turned to transfers for replacement water in response to cutbacks of contract allocations under the Central Valley Project Improvement Act. Typically, farmers purchase water on a year-to-year basis. Most long-term and permanent transfers are destined for urban users.

Three regions are major participants in water transfers: the 10-county Sacramento Valley, the 8-county San Joaquin Valley and Tulare Lake Basin, and the seven-county Southern California region (See footnote, right). In most years, roughly 75 percent of transfers originate within the Sacramento and San Joaquin Valleys, with the remainder from Southern California. Overall, most transfers are between users within the same county (nearly 25 percent) or within the same region (nearly 50 percent). Interregional transfers account for the remaining 25-30 percent of transfers. Only 20 percent of these transfers are negotiated directly between parties in different regions; the rest move through programs run by DWR and USBR. AND SWRCB

Current oversight of water transfers in California

Before the Drought Water Bank program, water transfers were usually arrangements between two parties, one with extra water and one with unmet water demands. These parties would reach a mutually acceptable arrange-

Footnote

Data availability allows regional definitions for county groupings, but not DWR's hydrologic regions. Notably, Southern California includes both the South Coast and Colorado River hydrologic regions (Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties), and the San Joaquin Valley includes both the San Joaquin River and Tulare Lake hydrologic regions (Fresno, Kings, Kern, Madera, Merced, San Joaquin, Stanislaus, and Tulare counties). Sacramento Valley counties include Butte, Colusa, Glenn, Placer, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba

AND PART OF THE COSTS OF PROJECTS BUILT BEFORE 1989

Information sources

CALFED. Water Transfer Program Plan. July 2000

CALFED. Programmatic Record of Decision. August 29, 2000.

DWR. Water Transfer Papers for Water Transfers in 2002 Involving the Department of Water Resources (Draft 3-8-02) (www.watertransfers.water.ca.gov)

DWR. Draft EIR/S for the Environmental Water Account. July 2003.

Governor's Advisory Drought Planning Panel. Critical Water Shortage Contingency Plan. December 29, 2000.

Hanak, Ellen, "Who Should Be Allowed to Sell Water In California? Third-Party Issues and the Water Market". Public Policy Institute of California. San Francisco, CA, June 2003

Jenkins, M.W., et al. "Improving California Water Management. Optimizing Value and Flexibility," University of California, Davis, CA, http://cee.engr.ucdavis.edu/faculty/lund/CALVIN/, 2001.

Newlin, B.D., M.W. Jenkins, J.R. Lund, and R.E. Howitt, "Southern California Water Markets: Potential and Limitations," Journal of Water Resources Planning and Management, ASCE, Vol. 128, No. 1, pp. 21-32, January/February 2002.SWRCB. A Guide to Water Transfers (DRAFT). July 1999.

SWRCB. "Water Transfer Issues in California: Final Report to the California State Water Resources Control Board by the Water Transfer Workgroup". June 2002.

MOST

among IID, MWD, Palo Verde Irrigation District (PVID) and Coachella Valley Water District (CVWD). The Agreement provided for water conservation from 17 projects to be built by IID under the Program. Projected water conservation, when the final project was placed into operation, was 106,110 acre-feet of water per year. MWD funded all costs of the new projects in return for having this additional amount of Colorado River water available for diversion through its Colorado River Aqueduct.

The Agreement called for a Program Coordinating Committee (PCC) to secure effective cooperation and interchange of information and to provide consultation, review, and approval on a prompt and orderly basis between IID and MWD in connection with various financial, economic, administrative, and technical aspects of the Program. The Approval Agreement called for a Water Conservation Measurement Committee (WCMC) to provide an orderly basis, among the parties, for verification of the amount of water conserved and different amounts conserved by the individual projects. All Program actions of the PCC are to be approved by a majority vote. WCMC decisions, however, are to be approved by unanimous vote. If unanimity is lacking, the matter is taken up according to a dispute resolution procedure set forth in the Approval Agreement.

SUPPORTING GROWTH IN POPULATION AND COMMERCE,

Potential benefits from water transfers

For receiving areas, water transfers have the potential of reducing economic disruption, maintaining community stability, and improving environmental conditions caused by water scarcity in return for providing economic compensation to sellers. Sellers can use this compensation to fund beneficial activities, although there is no guarantee that benefits to the seller will benefit the source area as a whole. Compensation from most transfers involving agricultural water goes directly to the participating landowner with a smaller percentage going to the water districts, which can use the income to reduce water rates, improve facilities, or improve environmental conditions. For example, Western Canal Water District used proceeds from drought water bank sales to remove diversion dams and reconfigure its canals to reduce impacts on threatened spring-run salmon. Farmers can reinvest back into the farming business. Transfers by regional water agencies can provide more resources to benefit the entire community. For example, the Yuba County Water Agency has used more than $10 million from the proceeds of water transfers over the past several years to fund needed flood control projects.

(See change from 75 yrs duration)

In addition to the about 1.2 MAF transferred in recent years, there are several pending long-term transfers from agriculture to agriculture, urban, or environmental ~~use~~ as shown in Figure 3. These include transfers proposed under the Colorado River Quantification Settlement Agreement. HAD [Local agencies ~~have until Oct. 12, 2003, to adopt the QSA~~]. Beyond those transfers shown in Figure 3, economic studies (see footnote, right) indicate that about 300,000 acre-feet in the Sacramento Valley and 400,000 acre-feet in the San Joaquin Valley could be made available through crop idling without unreasonably affecting the overall economy of the county from where the water would be transferred. These studies estimate that the economic effects of idling up to 20 percent of the rice land in the Sacramento Valley and up to 20 percent of the cotton lands in the San Joaquin Valley in any given year are near 1 percent or less of the county-wide economy, except in Glenn and Colusa counties where the impact would be less than 5 percent of the county-wide economy. The amount of land that would be idled is less than 10 percent of the total agriculture lands in these counties. The studies did not evaluate the economic effects of crop idling on commodity markets.

NO LONGER GERMAIN

A statewide economic-engineering optimization study by the University of California, Davis, (Jenkins, et al. 2001; Newlin et al. 2002) highlights potential benefits of water transfers to meet forecasted future water scarcity. Results suggest that by 2020 water transfers combined with conjunctive management and various operational changes could provide more economic benefits as high as $1.3 billion per year statewide by reducing forecasted economic impacts of water scarcity as much as 80 percent. Almost all of the benefit comes from intra-regional water transfers and operational improvements within five regions of California, especially in Southern California. The study indicates that the maximum reduction in deliveries to a major water user would be 15 percent with most transfers averaging much less. The study concludes that only a small proportion of California's water need be transferred to achieve significant economic benefits. Much of the added benefits would be from increased flexibility added to the water management system through reoperation of surface water and groundwater supplies using conjunctive management. As an optimization study, these results represent a simplification of California's water management system and do not address legal and institutional barriers that may prevent full implementation.

Footnote

Studies conducted for preparing the Public Draft EIR/EIS for the Environmental Water Account dated July, 2003.

Potential costs of water transfers

The direct costs of completing a water transfer includes more than just the sale price of water, which is typically at the last point the seller controls the water. Additional direct costs to the buyer include conveyance, storage, and treatment costs, and physical losses between the location and time of sale and the place and time the water is used by the buyer. Sale prices reflect the cost to make the water physically available and, in some cases, added monitoring or mitigation needed to ensure compliance with federal and state legislative guidance related to water transfers. The buyer typically arranges for transferred water to be conveyed to their area of use. Conveyance costs can be significant, as much as the price paid to the seller. For example, prices paid to the seller in 2002 and 2003 for the Environmental Water Account and Dry Year Water Purchase Programs operated by DWR ranged from $75 to $185 per acre-foot. The lower prices reflect a source in Northern California and the higher prices reflect the price to EWA of banked groundwater and conveyance costs in Kern County in years of 50 percent State Water Project allocations.

In addition to the direct costs of a water transfer to the receiving areas, indirect costs to third parties also can occur, and there could be impacts to other water users and the environment from water transfers. These concerns are discussed under the issues that follow.

Major issues facing water transfers

Maintaining agricultural productivity - Because most water transfers come from agriculture, it is important to include the protection of agricultural productivity and economic benefits in water transfer policies. A key challenge is to balance the ability of agriculture to provide water for transfers on a periodic basis to help with temporary water scarcity with limits so that transfers do not destabilize California's agricultural productivity and economy.

or damage the environment

Duplication (said earlier)

Balanced approach to regulating transfers – State water law requires that transfers not injure any other legal user of water, not unreasonably affect fish and wildlife, and not unreasonably affect the overall economy of the county from which the water is transferred. There is a concern by some that existing state laws and oversight of water transfer are not adequate to protect the environment, third parties, public trust resources, and broader social interests that may be affected by water transfers. This is particularly the concern for water transfers involving pre-1914 water rights, which are not subject to regulation by SWRCB, and transfers that involve pumping groundwater or crop idling and crop shifting. Conversely, ~~there is~~ also concern that efforts to more heavily regulate water transfers may unnecessarily restrict many short-term, intra-regional transfers that have multiple benefits during temporary supply shortages and that have little likelihood of direct or indirect impacts. The key issue is how to balance these concerns to allow water transfers to continue as a viable water management strategy while having mechanisms to minimize effects on others.

In practice this is only theory. SWRCB Regulates 1914 water right, if it is pre 1914

Environmental concerns – Environmental consequences of transfers could occur in three places: the area *from* which water is transferred, the area *through* which water is conveyed and the area *to* which water is transferred. Cumulative effects of short- and long- term transfers could have impacts on habitat, water quality, and wildlife caused by substituting groundwater for surface water, changing the location, timing, and quantity of surface diversions, or changing crop patterns through crop shifting or idling. For example, rice growing areas could have significant secondary benefits as wildlife habitat. Transfers that involve crop idling in these areas could either harm or benefit wildlife depending on implementation. Transfers that involve increased groundwater pumping also raise concerns over groundwater overdraft and the long term sustainability of groundwater resources. In addition, long term water transfers that induce new urban development in the receiving area may have environmental impacts.

Using limited duration transfers for long-term demands – There is a concern that transfers of limited duration are being used for long-term demands. For example, transfers under the Environmental Water Account, Central Valley Project Improvement Act, and related programs are designed to improve environmental conditions. Because these transfers change every year, and in some cases rely on public funding, they may not provide long term protection for the environment.

Economic concerns – Short term, out of county transfers created through extensive crop idling can reduce production and employment of both on farm and secondary economic sectors resulting in reduced tax revenues and increased costs for farmers not participating in the transfer. These reduced revenues could affect local governments disproportionately with potential impacts to spending on a wide range of services provided by local governyou use "shifting" on page 191

CROP CHANGES

water savings from crop idling, or increase groundwater use. Information may be needed on historical and current land use and water use, groundwater levels, land subsidence, water quality, environmental conditions, and surface water flows.

Need for more integrated management of water resources – In California, authority is separated among local, state and federal agencies for managing different aspects of groundwater and surface water resources. Several examples highlight this: 1) SWRCB has jurisdiction for appropriative water rights dating from 1914, but disputes over appropriative water rights dating before 1914 are settled by the court system; 2) Similarly, SWRCB has jurisdiction over groundwater quality, but disputes over groundwater use are settled by the court system ; 3) Ordinances adopted by counties to protect groundwater resources only apply to the portion of the groundwater basin they overlie and may conflict with water districts trying to implement water transfers that have their own groundwater management plan. Failure to integrate water management across jurisdictions makes it difficult to develop transfers with multiple benefits, provide for sustainable use of resources, identify and protect or mitigate potential impacts to third parties, and ensure protection of legal rights of water users, the environment, and public trust resources. While regional integrated management is becoming more common, additional policy and financial incentives are needed.

Infrastructure and operational limits - The ability to optimize the benefits of water transfers depends on access to and the physical capacity of existing conveyance and storage facilities. For example, when export facilities in the Delta are already pumping at full capacity, transferable water cannot be moved. This occurred in 2003 when the Metropolitan Water District of Southern California (MWDSC) negotiated water transfers with growers in the Sacramento Valley but was unable to move water through the Delta where the conveyance system was flowing full, or to store the water in Lake Oroville, which filled with late spring rain. The ability to convey water is also an important aspect of the potential water transfer between the Imperial Irrigation District and the San Diego County Water Authority, which requires access to the Colorado River Aqueduct owned and operated by MWDSC, of which SDCWA is only a member.

Table 1. Pending Long-Term Water Transfers[1]				
Seller	**Buyer**	**Maximum Annual Acre-feet**	**Duration (years)**	**Purpose (from/to)**
Imperial ID	San Diego County WA	200,000	~~75~~ 45	Agriculture to Agriculture and Urban
Imperial ID	Coachella Valley WD	103,000	~~35~~ 45	Agriculture to Agriculture
Imperial ID	Metropolitan WDSC	78,000	45 ~~75~~	Agriculture to Urban
Butte WD	Madera ID and Root Creek WD	15,000	25	Agriculture to Urban
Merced ID	U.S. Fish and Wildlife	47,000	10	Agriculture to Environment
Palo Verde ID	Metropolitan WDSC	111,000	35	Agriculture to Urban
South San Joaquin ID	Cities of Tracy, Escalon, Manteca, and Lathrop	75,000	25	Agriculture to Urban
	Total	629,000		

[1] Data in this table are drawn from Table A.5 of Ellen Hanak, *Who Should Be Allowed to Sell Water in California? Third-Party Issues and the Water Market*, Public Policy Institute of California, 2003 (available for download at www.ppic.org). These data do not include transfers between farmers within the same water district, which can be substantial in some places.